IN THE CLAIMS

1. A multicast network management method, comprising the steps of:

generating a packet-tracking queue with individual entries representing datapackets for transfer through a hierarchical network;

storing an actual multicast datapacket and its real payload in a first-in, first-out (FIFO) buffer;

expanding any packet-tracking queue entry representing a multicast datapacket into several consecutive entries, one each for the individual subscribers enrolled to receive a broadcast, and wherein, each expanded entry is subject to its own unique bandwidth-allocating service-level policy;

flagging a first of such expanded entries as being first, and flagging a last such expanded entry as being last; and

releasing and clearing said datapackets in any order, and if the first or last are released, then the next or previous are marked as first or last;

wherein, individually delayed releases of duplicated multicast datapackets enforce a bandwidth limiting function of any service-level policies involved.

2. The method of claim 1, further comprising the step of:

checking to see if only a single-remaining expanded entry is left by seeing if it is flagged as being both first and last.

3. The method of claim 2, further comprising the steps of:

releasing said single-remaining expanded entry; and

clearing said packet-tracking queue and said actual datapacket and its real payload in said FIFO buffer.

4. The method of claim 1, further comprising the steps of:

associating a service-level policy that limits allowable bandwidths to particular nodes in a hierarchical network;

classifying datapackets moving through said hierarchical network according to a particular service-level policy;

managing all datapackets moving through said hierarchical network from a variable-depth queue in which each queue entry includes service-level policy bandwidth allowance for a node in said network through which a corresponding datapacket must pass;

repeatedly scanning said variable-depth queue to determine whether a datapacket should be forwarded through said node by checking for enough bandwidth-allocation credits; and

replenishing an account of said bandwidth-allocation credits taking into account a variable delay caused by scanning said variable-depth queue.

5. The method of claim 4, further comprising the step of:

testing in parallel whether a particular datapacket should be delayed in a buffer or sent along for every hierarchical node in said network through which it must pass.

6. The method of claim 4, further comprising the step of:

constructing a single queue of entries associated with corresponding datapackets passing through said hierarchical network such that each entry includes source and destination header information and a list of any available bandwidth credits for every hierarchical node in said network through which a corresponding datapacket must pass.

7. A hierarchical network for use with multicast, comprising:

means for generating a packet-tracking queue with individual entries representing datapackets for transfer through a hierarchical network;

means for storing an actual multicast datapacket and its real payload in a first-in, first-out (FIFO) buffer;

means for expanding any packet-tracking queue entry representing a multicast datapacket into several consecutive entries, one each for the individual subscribers enrolled to receive a broadcast, and wherein, each expanded entry is subject to its own unique bandwidth-allocating service-level policy;

means for flagging a first of such expanded entries as being first, and flagging a last such expanded entry as being last;

means for releasing and clearing said datapackets in any order, and if the first or last are released, then the next or previous are flagged as being first or last;

means for checking to see if only a single-remaining expanded entry is left by seeing if it is flagged as being both first and last;

means for releasing said single-remaining expanded entry; and

means for clearing said packet-tracking queue and said actual datapacket and its real payload in said FIFO buffer;

wherein, individually delayed releases of multicast datapackets enforce a bandwidth limiting function of any service-level policies involved at independent network nodes.

8. The network of claim 7, further comprising:

means for associating a service-level policy that limits allowable bandwidths to particular nodes in a hierarchical network;

means for classifying datapackets moving through said hierarchical network according to a particular service-level policy;

means for managing all datapackets moving through said hierarchical network from a variable-depth queue in which each node entry includes service-level policy bandwidth allowance for a node in said network through which a corresponding datapacket must pass;

means for repeatedly scanning said variable-depth queue to determine whether a datapacket should be forwarded through said node by checking for enough bandwidth-allocation credits; and

means for replenishing an account of said bandwidth-allocation credits taking into account a variable delay caused by scanning said variable-depth queue.

9. The means of claim 8, further comprising:

means for testing in parallel whether a particular datapacket should be delayed in a buffer or sent along for

every hierarchical node in said network through which it must pass.

10. The means of claim 8, further comprising:

means for constructing a single queue of entries associated with corresponding datapackets passing through said hierarchical network such that each entry includes source and destination header information and a list of any available bandwidth credits for every hierarchical node in said network through which a corresponding datapacket must pass.

11. A network management system, comprising:

a protocol processor providing for header inspection of datapackets circulating through a network and providing for an information output comprising at least one of source IP-address, destination IP-address, port number, and application type;

a classifier connected to receive said information output and able to associate a particular datapacket with a particular network node and a corresponding service-level policy bandwidth allowance;

a variable-depth queue comprising individual entries related to said datapackets circulating through said network, and further related to a network node through which each must pass;

a replicator for duplicating datapackets in a multicast stream for each enrolled subscriber, and able to expand the variable-depth queue with expanded multicast entries; and

a traffic-shaping cell providing for an inspection of each one of said individual entries and for outputting a

single decision whether to pass through or buffer each of said datapackets in all network nodes through which each must pass;

wherein, individually delayed releases of multicast datapackets enforce a bandwidth limiting function of any service-level policies involved.

12. The system of claim 11, further comprising:

an output scheduler and marker for scheduling a released datapacket for output, and for marking it according to an output received from the traffic-shaping cell.

13. The system of claim 11, further comprising:

at least one of the protocol processor, classifier, replicator, and traffic-shaping cell, are implemented as a semiconductor intellectual property and operate at run-time with the variable-depth queue.